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ONUPHIDAE (POLYCHAETA) FROM BELIZE, CENTRAL AMERICA, WITH NOTES ON RELATED TAXA

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Abstract.—Material collected at Carrie Bow Caye and other locations in Dangriga district, Belize, can be assigned to the following taxa: *Americonuphis magna* (Andrews), *Diopatra cuprea* (Bosc), *Onuphis* (*Nothria*) *dangrigae,* new species, *Onuphis* (*Onuphis*) *geminata,* new species, *O.* (*O.*) *pulchra,* new species, and *O.* (*O.*) *virgata,* new species. *O.* (*N.*) *intermedia* Kinberg, *O.* (*N.*) *veleronis,* new name, *O.* (*O.*) *fragilis* Kinberg, and *O.* (*O.*) *lineata,* new name, are discussed based on examination of the type materials.

Introduction

Twenty species of onuphid polychaetes are presently known from Gulf of Mexico and the Caribbean Seas (Table 1). Of these, about half are known only from waters deeper than 200 m, at least as far as their distribution in this region is concerned. The family appears poorly represented in shallow water and intertidal areas here compared to regions at similar latitudes in the eastern Pacific Ocean (Fauchald, 1968; Hartman, 1968). Especially striking is the dearth of species of *Diopatra* in shallow water. Members of the genus *Onuphis* are frequent in slope and bathyal depths, whereas *Diopatra* is more species-rich in the shallows of the warm water regions of the eastern Pacific Ocean and in the Mediterranean Sea (Fauvel, 1923; Fauchald, 1972). Paxton (1979) demonstrated, however, that members of the genus *Onuphis* are common in shallow water in Australia.

The discrepancy in representation of the two genera between the eastern Pacific Ocean and the Western Atlantic, could be caused by differences in collecting efforts; however, the presence of four new species of *Onuphis* in very shallow water in Belize, without a corresponding increase in the number of species of *Diopatra,* tends to affirm the preliminary impression of a large-scale difference in the number of shallow water species in the two genera between the two oceans.

The material was collected as part of the Smithsonian Institution's *Investigation of Marine Shallow Water Ecosystems* (IMSWE-program) coordinated by Dr. Klaus Ruetzler. A series of individual collections were made by Drs. Meredith L. Jones (stations marked CB-1 through CB-41C), Joan D. Ferraris (st. JDF-24-1), Brian F. Kensley (K-44 and K-48) and the author (F-9 through F-33). Most specimens were collected by hand or with shovel, narcotized using oil of cloves, fixed in approximately 4% formaldehyde in

sea water neutralized with hexamine and transferred to 70% ethyl alcohol for storage. All material is deposited in the collections of the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Types of other species were borrowed from Riksmuséet, Stockholm, Sweden and from the Allan Hancock Foundation, University of Southern California, Los Angeles.

Station List

Collected by Kristian Fauchald

F-9. 12 April 1979. Carrie Bow Caye, north of the island, sand and small rubble, 30–60 cm depth.

F-19. 23 October 1979. Carrie Bow Caye, southwest of island, *Thalassia* and sand, coarse-screened in 2 mm screen.

F-21. 28 October 1979. Carrie Bow Caye, east of island, about 3 m inside inner edge of *Thalassia*-bed, 30–40 cm depth, coarse-screened in 2 mm screen.

F-28. 4 November 1979. Carrie Bow Caye, east of island, about 60 feet from shore, *Thalassia* and sand, about 50 cm depth. Coarse-screened in 2 mm screen.

F-33. 8 November 1979. Carrie Bow Caye, north of island, *Thalassia,* sand and rubble, 60 cm depth.

Collected by Joan D. Ferraris

JDF-24-1. 30 April 1975. Carrie Bow Caye, lagoon, sand patch N of dock, 30 cm, shovel and ¼ inch mesh screen.

Collected by Meredith L. Jones

CB-1. 4 April 1976. Carrie Bow Caye, sparse *Thalassia* just west of island, 1 m depth.

CB-2. 5 April 1976. Carrie Bow Caye, northwest of island, general transect from bare sand area to coral rubble, .5 to 1.5 m depth.

CB-3. 5 April 1976. Carrie Bow Caye, east of laboratory, sand areas mixed with coral rubble, just inside reef crest, about 1 m depth.

CB-6. 6 April 1976. Carrie Bow Caye, sieved from sandy areas at top of intertidal around island, less than 30 cm depth.

CB-7. 6 April 1976. Carrie Bow Caye, associated with old conch shell and sand, on southwest edge of island, 30 cm depth.

CB-8. 6 April 1976. Carrie Bow Caye, east side of island, associated with coral pieces at water edge and above.

CB-11. 7 April 1976. Carrie Bow Caye, 100 m north northeast of island, associated with *Acropora curvicornis* rubble, stagnated overnight.

CB-14. 9 April 1976. Carrie Bow Caye, back side of reef crest, coral rubble, stagnated overnight.

CB-16. 11 May 1977. Carrie Bow Caye, sparse *Thalassia*.

CB-18. 11 May 1977. Carrie Bow Caye, 100 m southwest of island, sieved from coral rubble.

CB-23. 12 May 1977. Carrie Bow Caye, sand immediately behind inner reef crest at far side of flat, northeast of laboratory.

CB-28. 13 May 1977. Carrie Bow Caye, northwest of island, near inner end of permanent transect, *Thalassia,* apparent luxuriant growth, but no compact rhizome masses, coarse sand, 1–1.5 m depth.

CB-34. 14 May 1977. Carrie Bow Caye, 100 m north of island, 1.5 m depth.
CB-40A. 16 May 1977. Halfway between Colson Point and Salt Creek, Dangriga district, *Thalassia*, fine sand, almost mud, 1 m depth.
CB-40B. 16 May 1977. Halfway between Colson Point and Salt Creek, Dangriga district, bare sand from .5 m depth to shore, much warmer water toward shore, about 15 cm depth. Fine sand, almost mud.
CB-41C. 17 May 1977. Commerce Bight Pier, Dangriga district, transect over 75–80 m, from 1.5 m depth to shore, at 1.5 m soft brown mud over more compact black mud.

Collected by Brian F. Kensley.

K-44. 8 April 1979. Twin Cayes, rocks and coral rubble, 30 cm depth.
K-48. 10 April 1979. Carrie Bow Caye, coarse calcareous sand in upper spur and groove zone, no rubble or algae included, 1 m depth.

The terms applied to the morphological features are by and large the same used by Hartman (1944a) and Fauchald (1968). Some clarification of structural relations in the parapodia may be useful. In anterior parapodia 2–4 acicula support an *acicular lobe* which usually is distally truncate or rounded. The *presetal lobe* which is anterior to the acicular lobe, is usually a low fold that follows the outline of the acicular lobe closely; it is however frequently cut away on the ventral side leaving the acicular lobe exposed (Fig. 1b). The *postsetal lobe* usually has a broad, somewhat flattened base and a digitate or clavate distal part, extending well beyond the acicular lobe (Fig. 1b and others). The anterior parapodia can be extended or retracted. In the latter condition a contraction fold (Fig. 3b) may develop across the parapodium. This fold is normally at the base of either the dorsal or ventral cirrus or both. The contraction fold, called the low transverse fold, was treated, undeservedly, as a structural feature by Fauchald (1968); its presence depends entirely on the state of contraction of the parapodium and while its presence is interesting it is not of any great taxonomic importance.

The acicula are thick gently tapering rods inside the body; at emergence they are bent and taper abruptly to fine, needle-like tips.

The setal distribution in the anterior parapodia vary somewhat, but in general two distinct fascicles of setae can be recognized. Above and in front of the acicula (*i.e.* in a superior preacicular position) is found a fascicle of tapering, limbate setae. Below and slightly inferior to the acicula (*i.e.* in an inferior, postacicular position) are found pseudocompound hooded hooks. A single simple seta may be present directly below the acicula. If compound spinigers are present, these are always ventral, usually distinctly posterior to the acicula. The limbate setae shift to postacicular positions by setiger 20 in most species; they remain above the acicula in anteromedian setigers, but are directly behind the acicula in posterior setigers.

Several different kinds of hooks may be present; in this paper are treated species with three different kinds. In anterior setigers, usually in 2 to 5

setigers, are found *pseudocompound hooded hooks*. These hooks may be distally entire and falcate, or, more usually, bi- or tridentate. Most species have usually a single sort of hook, either uni- bi- or tridentate, but some have two sorts of hooks (*e.g.* both bi- and tridentate).

Another kind of hook may also be present in some anterior setigers. The *large hooks* are always tridentate, are usually less distinctly compound and at least twice as thick-shafted as the pseudocompound ones in the same setiger. Both kinds of hooks can be present in the same setiger, but the large hooks are usually present in more setigers than are the pseudocompound ones.

A pair of bidentate, hooded *subacicular hooks* are present in all median and posterior setigers. Each hook originates above the base of the acicula, but emerges from the acicular lobe well below the acicula, thus the trajectory of the subacicular hook forms a distinct angle with that of the acicula.

It is possible to have both pseudocompound and large hooks in the same setiger as mentioned above; likewise, compound spinigers and large hooks may occur in the same setiger. However, pseudocompound hooks and compound spinigers do not occur in the same setiger. Both compound spinigers and large hooks usually terminate before the start of the subacicular hooks. One or several segments without any kinds of hooks may be present between the last large and the first subacicular hook.

Pectinate setae are present in most median and posterior setigers. The distal edge may be at right angles to the shaft (transverse) or be at another angle with the shaft (oblique); the number of teeth vary from about 10 to more than 25.

The taxonomic treatment in this paper follows traditional lines with one exception; the inclusion of simple statistical tables demonstrating the patterns of variability within each species is unusual in the polychaete literature. A couple of interesting and potentially very important features emerged from this treatment. First, within a population variability is restricted, even over a two-year time span (*Onuphis* (*Onuphis*) *pulchra* at Carrie Bow Caye); second, in comparing different taxa, the same characters do not stay invariant for all taxa (cf. the different species of *Onuphis* (*Onuphis*) in the tables below). Two conclusions can be drawn. No single character can be used to discriminate among three or more taxa even when these are closely similar. The limited variation exhibited within a taxon from a single location emphasizes the necessity of extremely careful comparisons among various populations referred to the same taxon. A simple overlap in selected character states is insufficient to demonstrate identity between two populations and a much more exhaustive analysis must be performed in order to demonstrate such identity.

A character usually avoided in the polychaete literature is the color pattern. These patterns were found to be highly characteristic in the present

material and are described in some detail below; they have been omitted from the illustrations to avoid clutter. It should be noted that the color pattern was easily identifiable in alcoholic specimens.

Family Onuphidae Kinberg, 1865
Genus *Americonuphis* Fauchald, 1973
Americonuphis magna (Andrews, 1891)

Diopatra magna Andrews, 1891a:121, pl. 2, figs. 1–7; 1891b:286–287, pl. 14, figs. 14–20.—Wilson, 1900:351.

Onuphis magna.—Treadwell, 1921:78–81, pl. 7, figs. 1–5, textfigs. 279–287.—Pearse, 1936:181.—Hartman, 1944a:70; 1944b:21; 1945:24; 1951:51.—Day, 1973:54. ?Monro 1928:89. [Not Monro, 1933:76, nor Berkeley and Berkeley, 1939:336].

Americonuphis magna.—Fauchald, 1973:22.—Gardiner, 1976:193, fig. 25a–d.

Material examined.—CB-40A (1 specimen).

Remarks.—*A. magna* can be separated from the closely similar *A. reesei* Fauchald (1973) by the branchial structure and maxillary formula. *A. magna* has about 12 branchial filaments where the branchiae are best developed, *A. reesei* has, maximally, seven branchial filaments. The maxillary formula for *A. magna* is 1+1, 8+8, 6+0, 5+9 and 1+1; for *A. reesei* the formula is 1+1, 10+12, 14+0, 4+9 and 1+1 (this formula was incorrectly reported in Fauchald, 1973). The specimen reported as *Onuphis magna* by Berkeley and Berkeley (1939:336, USNM # 38269) has been re-examined and is here referred to *A. reesei*. Monro (1928) did not describe his specimen adequately so his record must be considered doubtful. There are currently no validated reports of *A. magna* from the eastern Pacific Ocean.

Gardiner (1976) pointed out that the generic name *Americonuphis* was applied independently by Orensanz (1974) to a different group of species. Paxton (1979:279) rectified the situation by renaming Orensanz's taxon *Australonuphis*.

A. magna is known from intertidal and shallow subtidal sand flats from North Carolina through the Caribbean Sea and the Gulf of Mexico.

Genus *Diopatra* Audouin and Milne Edwards, 1833
Diopatra cuprea (Bosc, 1802)

Nereis cuprea Bosc, 1802:143–144 (illustrations published 1830).

Diopatra cuprea.—Pettibone, 1963:250–254, fig. 66a–e (and references therein).—Gardiner, 1976:185, fig. 23e–i.

Diopatra cuprea cuprea.—Day, 1967:417, fig. 17:12a–d; 1973:54.

Material examined.—CB-1 (11 specimens); CB-2 (2); CB-6 (1); CB-11 (1); CB-16 (1); CB-28 (6); CB-34 (2); CB-40B (3); CB-41C (5); F-9 (1); F-28 (1).

Remarks.—*D. cuprea* is usually described as being evenly reddish brown without distinct dorsal color pattern. Specimens from Belize differ in that they have scattered brown pigment spots over most of the dorsum and transverse dark brown bands at setiger 5 or setgers 5 and 6. Most specimens are small compared to specimens reported from more northerly locations.

D. cuprea is very similar to *D. ornata* Moore (see Hartman, 1968:659 for a description). The two can be separated by the structure of the anterior hooks. The proximal tooth of each pseudocompound hook is gently curved in *D. cuprea* and nearly parallel to the axis of the hook; it is strongly curved and nearly at right angles with the axis of the hook in *D. ornata* (Hartman, 1944a:54). There are also differences in the patterns of papillae on the ceratostyles. *D. cuprea* has papillae of two kinds, organized in 16–18 longitudinal rows, whereas *D. ornata* has same-sized papillae densely scattered over the ceratostyles (Hartman, 1944a:54–55). These characters were reexamined in the present collections; while somewhat obscure, they appear absolutely consistent.

D. cuprea has been reported from New England to Brazil in the Western Atlantic Ocean and along west Africa to the Indian Ocean. In view of the great similarity between *D. cuprea* and related species a careful examination of material from all parts of its range should be undertaken.

Genus *Onuphis* Audouin and Milne Edwards, 1833
Subgenus *Nothria* Malmgren, 1867
Onuphis (*Nothria*) *dangrigae*, new species
Figs. 1–2, Tables 2–3

Material examined.—CB-1 (1 specimen); CB-3 (9 paratypes, USNM 61225); CB-6 (4); CB-7 (10); CB-8 (1); CB-11 (3); CB-14 (1); CB-16 (2); CB-18 (1); CB-23 (1, holotype, USNM 61224); CB-28 (1); K-44 (2); K-48 (2 juveniles); JDF 24-1 (1).

Description.—The holotype is an incomplete specimen with 66 setigers that is 28 mm long and 1.5 mm wide with setae. Other, complete specimens have about 120–130 setigers and are about twice as long as the holotype, but no wider. All specimens are white and lack color patterns, as preserved. The anterior part of the body, including the first 5 setigers is cylindrical; in the rest of the body the dorsal side is strongly flattened and the ventral side convex. Two anal cirri are present.

The prostomium (Fig. 1a) is about as wide as long and has a pair of very small, black eyespots near the base of the frontal antennae. Each frontal antenna is triangular and slightly pustulate. The ceratophores of all 5 occipital antennae have 4 or 5 rings, of which the distalmost is much longer than any of the others. The outer lateral antennal styles reach the anterior margin of the second setiger; the inner lateral and median styles are similar in length

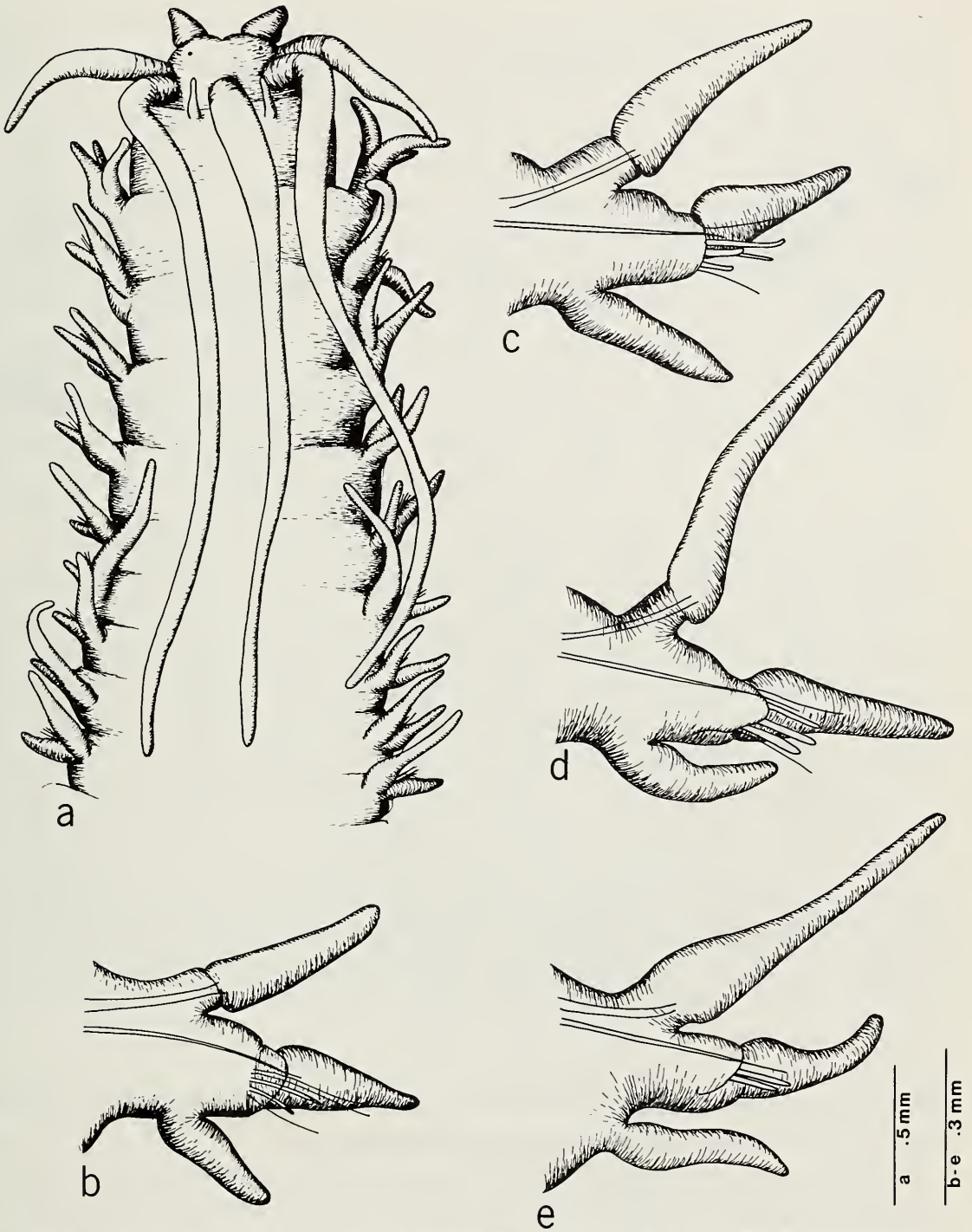

Fig. 1. *Onuphis* (*Nothria*) *dangrigae* (holotype, USNM 61224): **a,** Anterior end, dorsal view; **b,** Parapodium of setiger 1, anterior view; **c,** Parapodium of setiger 2, anterior view; **d,** Parapodium of setiger 3, anterior view; **e,** Parapodium of setiger 4, anterior view.

and reach the ninth or tenth setiger. The peristomium is about twice as wide as the prostomium and carries a pair of peristomial cirri near the anterior margin. Each cirrus is slender and barely reaches the middle of the prosto-

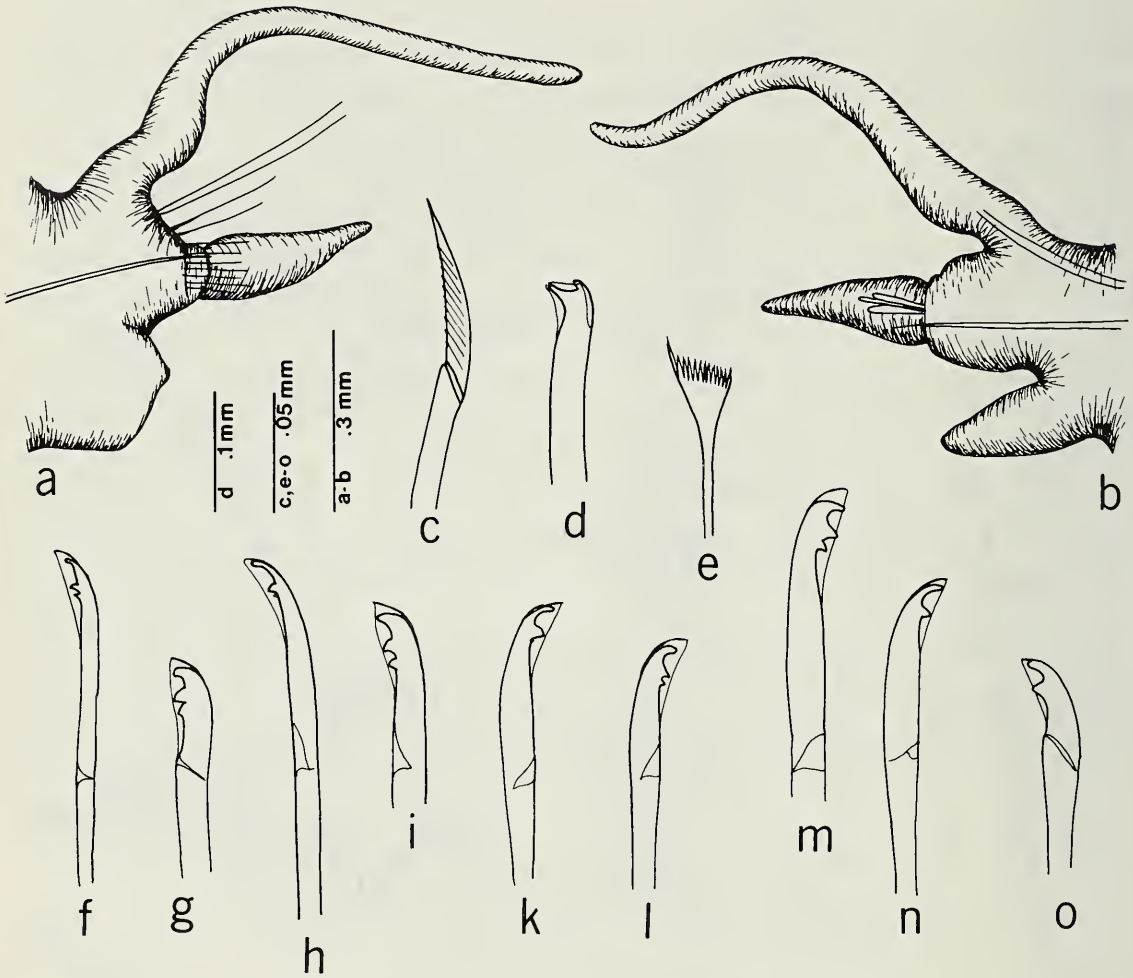

Fig. 2. *Onuphis* (*Nothria*) *dangrigae* (holotype, USNM 61224): **a,** Parapodium of setiger 6, anterior view; **b,** Parapodium of setiger 5, anterior view; **c,** Compound spiniger, setiger 6; **d,** Subacicular hook, setiger 50; **e,** Pectinate seta, setiger 50; **f–o,** Pseudocompound hooks, **f–g,** From setiger 1; **h–i,** From setiger 2; **k–l,** From setiger 3; **m–n,** From setiger 4; **o,** From setiger 5.

mium. The separation between the two peristomial rings is distinct on the ventral side, but cannot be seen on the dorsal side.

The parapodia are attached at the anterior edge of each of the 5 first setigers. The great development of basal parapodial muscles in each of these setigers makes each segment much wider anteriorly than posteriorly. The first 3 pairs of parapodia are directed obliquely forward and ventrally. Parapodium 4 is transitional; from parapodium 5 each parapodium is fully lateral in position and is situated at about the mid-length of each segment. Further posteriorly the parapodia take a position at the junction between the flat dorsum and the curved ventrum and in these segments the dorsal cirri appear to be attached directly to the dorsum. Each of the first parapodia (Figs. 1b–d) has a distally rounded acicular lobe; the presetal lobe is a low, transverse fold covering the bases of the setae. The postsetal lobe is clavate and

about as long as the parapodium from the base to the tip of the acicular lobe. The dorsal cirri have distinct cirrophores in the first 3 parapodia. Thereafter, the cirrophores are indicated only as thickenings near the base of each cirrus. The dorsal cirri double in length between the first and the sixth setiger (Figs. 1b–e, Fig. 2a–b) and then decrease slowly in length until in the last segments (in complete specimens) they are of about the same length as in the first setigers. The dorsal cirri decrease in width posteriorly and in far posterior setigers they are slender and nearly filamentous. Ventral cirri are distinctly cirriform through 4 or 5 setigers and are pad-shaped from setiger 6. The structure of the ventral cirrus in setiger 5 varies from a short, tapering cirrus, shorter, but similar in shape to those found in the first 4 setigers, to a glandular pad similar to the ones found in posterior setigers. In median parapodia the postsetal lobes decrease in size and are recognizable only as short papillae from about setiger 45.

Simple, flattened strap-like branchiae are first present from setigers 18–21.

Limbate and pectinate setae, pseudocompound bi- and tridentate hooks, compound spinigers and subacicular hooks are present. Limbate setae are sparsely present in all parapodia in the anterior one-third of the body. All acicula project beyond the tips of the acicular lobes as slender, slightly bent needles. The anterior 5 pairs of parapodia have pseudocompound hooks distributed in the following manner (examined in 5 specimens): In parapodium 1, 4 slender, tridentate hooks (Fig. 2f) with long appendages and one stout, tridentate hook (Fig. 2g) with short appendage. In parapodium 2, 3 slender, tridentate hooks (Fig. 2h) and 3 stout tridentate hooks (Fig. 2i). The proximal tooth is very small in all slender hooks and is difficult to see. In parapodium 3 the distinction between slender and stout hooks is absent, but 3 hooks (Fig. 2k) have slightly longer appendages than 2 others (Fig. 2l). The proximal tooth is much more reduced in hooks with long appendages than in those with short appendages. Parapodium 4 has 3 bidentate hooks (Fig. 2n) and a single tridentate one (Fig. 2m). In parapodium 5 there are 3 bidentate hooks (Fig. 2o); tridentate hooks are absent. Compound spinigers are found in subacicular positions from setiger 6 through the segment before the start of the subacicular hooks. Each spiniger (Fig. 2c) has a heterogomph articulation and a narrow, knife-edged blade with fine serrations. Subacicular hooks are first present from setigers 14–16, so the number of setigers with compound spinigers vary from 8 to 10. Each subacicular hook (Fig. 2d) is bidentate and has a distinct, short hood. Pectinate setae are present from setiger 6; each (Fig. 2e) is distally slightly oblique and has about 12 teeth. One side has a long spur.

The maxillary apparatus is poorly sclerotized. The maxillary formula is 1+1, 8+7, 7+0, 7+8 and 1+1 (based on the dissection of two paratypes). The mandibles are fused over most of their length.

The tubes consist of a thin, pliable inner lining and a loose cover of unsorted sand grains.

Remarks.—Other members of the subgenus *Nothria* with branchiae starting posterior to setiger 10 include *O. guadalupensis* (Fauchald, 1968:22–24, pl. 6, figs. e–l), *O. rubrescens* Augener (1906:139–141, pl. 4, figs. 76–83), *O. stigmatis* Treadwell (1922:176–178, figs. 22–34, see also Hartman, 1944a:89–91, pl. 11, figs. 240–247) and two species, originally described as subspecies of the latter, *O. cirrata* (Hartman, 1944a:92–93, pl. 11, figs. 248–253) and *O. veleronis,* new name (for *Nothria stigmatis intermedia* Hartman, 1944a:93–95, pl. 15, figs. 315–324, see below). Table 2 surveys important differences among these species. The structure of the pseudocompound hooks in anterior setigers is of particular importance; of the species listed above, only *O. guadalupensis* and *O. dangrigae* have both bi- and tridentate hooks. *O. dangrigae* has ringed ceratophores, cirriform ventral cirri on 4 or 5 setigers, 5 setigers with pseudocompound hooks and lacks color patterns. *O. guadalupensis* has smooth ceratophores, cirriform ventral cirri on 3 setigers and 3 setigers with pseudocompound hooks; in addition, it has a color pattern of dark dorsal cross-bars on anterior setigers.

The most widely reported species listed in Table 2 is *O. stigmatis*. In order to investigate the relationships between *O. dangrigae* and *O. stigmatis* a number of specimens of the latter, collected at the type locality, were examined (USNM 33713, False Bay, San Juan Island, Washington, summer, 1937, coll. M. Miller, det. Marian H. Pettibone). The results of the comparison is given in Table 3. As can be seen, the number of segments with pseudocompound hooks vary somewhat in *O. dangrigae,* but averages 4.5, whereas it is invariant at 3 in *O. stigmatis*. In contrast, the number of cirriform ventral cirri is invariant at 5 in *O. dangrigae* and varies somewhat, but averages 3.5 in *O. stigmatis*. Both features imply that *O. dangrigae* has one more segment involved in the head-formation than does *O. stigmatis*. *O. stigmatis* also retains a distinct color pattern, even after more than 40 years in alcohol; such patterns are absent even in live specimens of *O. dangrigae*.

O. dangrigae is known from several localities near Carrie Bow Caye and Twin Cayes, Belize, in *Thalassia* beds, coral rubble, sand and shells in shallow water.

Etymology.—The specific name is derived from the name of the district in Belize in which Carrie Bow Caye and Twin Cayes are located, Dangriga in Carib, or Stann Creek in English.

Onuphis (*Nothria*) *intermedia* Kinberg, 1865

Table 2

Onuphis intermedia Kinberg, 1865:560; 1910:40, pl. 14, fig. 9.—Augener, 1931:296–297, fig. 5.

Material examined.—Atlantic Ocean, off the entrance to the harbor at Rio de Janeiro, 30–40 fms (holotype, Riksmuséet, Stockholm, marked E.E. 191 and type number 461).

Remarks.—The type-material consists of one anterior end of about 50 setigers that is 9 mm long and about 1 mm wide and three median fragments, which may belong to another species. The remarks are based on the anterior end except where noted. The occipital ceratophores have 4 to 5 rings; branchiae are present from about setiger 25 as single filaments and all branchiae are single on the anterior fragment. The largest midpiece has 2 to 3 branchial filaments on each segment. Cirriform ventral cirri are present on the first 5 setigers. Tridentate pseudocompound hooks are present in the first 3 setigers; one hook is clearly thicker than the others, but is otherwise similar. A single compound spiniger is present in each parapodium from setiger 4 through setiger 13. Subacicular hooks are first present from setiger 13. All specimens are white without color patterns.

Augener (1931:296) also reviewed the type-material of this species, but his description does not fit the material nor does it fit the original description by Kinberg (1865) or the illustrations published in Kinberg (1910). Both description and illustrations by Kinberg fit the type-material very well and have been augmented above. It is unclear how Augener's interpretation arose; it has apparently led to confusion as to the number of taxa present in Argentinian waters. Orensanz (1974), using Augener's study as his authority for the description of Kinberg's species, reported a number of species of *Onuphis* from Argentinian waters. The specimens called *O. fragilis* by Orensanz (1974:94) clearly do not belong to that species (see below); they resemble *O. intermedia,* but differ from this species as well in a number of features. According to Orensanz, his specimens have branchiae first present from setigers 10–21 as single filaments; the ventral cirri are cirriform on 3 or 4 setigers and the occipital ceratophores are smooth. Tridentate pseudocompound hooks are present in the first 3 setigers and a single, large hook is continued through one additional setiger. Compound spinigers are present from setigers 4 or 5 to setigers 13 or 15 and subacicular hooks are first present from setigers 14–16.

Orensanz's specimens and *O. intermedia* both belong to the same group of *Onuphis* in that both have branchiae starting behind setigers 10 and have compound spinigers present in a number of anterior setigers. They are listed separately in Table 2.

Onuphis (*Nothria*) *veleronis,* new name

Table 2

Nothria stigmatis intermedia Hartman, 1944:93–95, pl. 15, figs. 315–324; 1968:686–687, figs. 1–6. [Not *Onuphis intermedia* Kinberg, 1865].

Material examined.—Northwest Anchorage, San Clemente Island, California, 20 fms, 12 September 1933 (holotype, AHF Poly 744; 5 paratypes, AHF Poly 745).

Remarks.—The holotype is an incomplete specimen with about 60 setigers that is 19 mm long and about .5 mm wide; the largest paratype consists of 85 setigers and is 32 mm long. Ceratophores are smooth; branchiae are first present from setigers 29–30 and ventral cirri are cirriform on the first 3 setigers. Tridentate pseudocompound hooks are present in 3 setigers and compound spinigers are present in setigers 4–13. A single large hook is present from setiger 4 ending between setigers 6 and 8. The first subacicular hook is in setigers 10–14. A unique feature is the presence of subdistally expanded acicula from setiger 4 to about setiger 8.

O. veleronis differs clearly from *O. stigmatis* (see Table 2) in that the latter has the first branchiae on setigers 18–22, subacicular hooks from setigers 14–16 and a color pattern consisting of dark cross-bars. *O. veleronis* lacks a color pattern. *O. veleronis* differs clearly from *O. intermedia* Kinberg in setal distribution. Thus a new name was needed for this taxon.

Etymology.—The type-material was collected on one of the shakedown cruises of the VELERO III of the Allan Hancock Foundation, University of Southern California, hence the specific name.

Subgenus *Onuphis* Andouin and Milne Edwards, 1833
Onuphis (*Onuphis*) *fragilis* Kinberg, 1865
Table 6

Onuphis fragilis Kinberg, 1865:561; 1910:40, pl. 15, fig. 11.—Augener, 1931:298, fig. 6. [Not *O. fragilis*.-Orensanz, 1974:94–95, pl. 7].

Material examined.—Atlantic Ocean, South of La Plata (holotype, Riksmuséet, Stockholm, marked E.E. 307 and type number 465).

Remarks.—The type-material fits very well with Kinberg's description and illustrations. Occipital ceratophores are smooth; branchiae are first present from setiger 6 and are bifid in most segments. Ventral cirri are cirriform in the first 7 setigers. Tridentate pseudocompound hooks are present in the first 6 setigers and a single large hook continues to setiger 12. Subacicular hooks are first present from setiger 25 and compound spinigers are absent.

Augener (1931:298) redescribed the type-material, but his description does not fit the material, not does it fit with the original description. For example, Augener did not find branchiae before setiger 12; branchiae are clearly present from setiger 6 in the type-specimen. It is unclear what caused this lapsus; apparently it led Orensanz (1974) to refer material, discussed above under *O. intermedia*, to this species, to which it clearly does not belong.

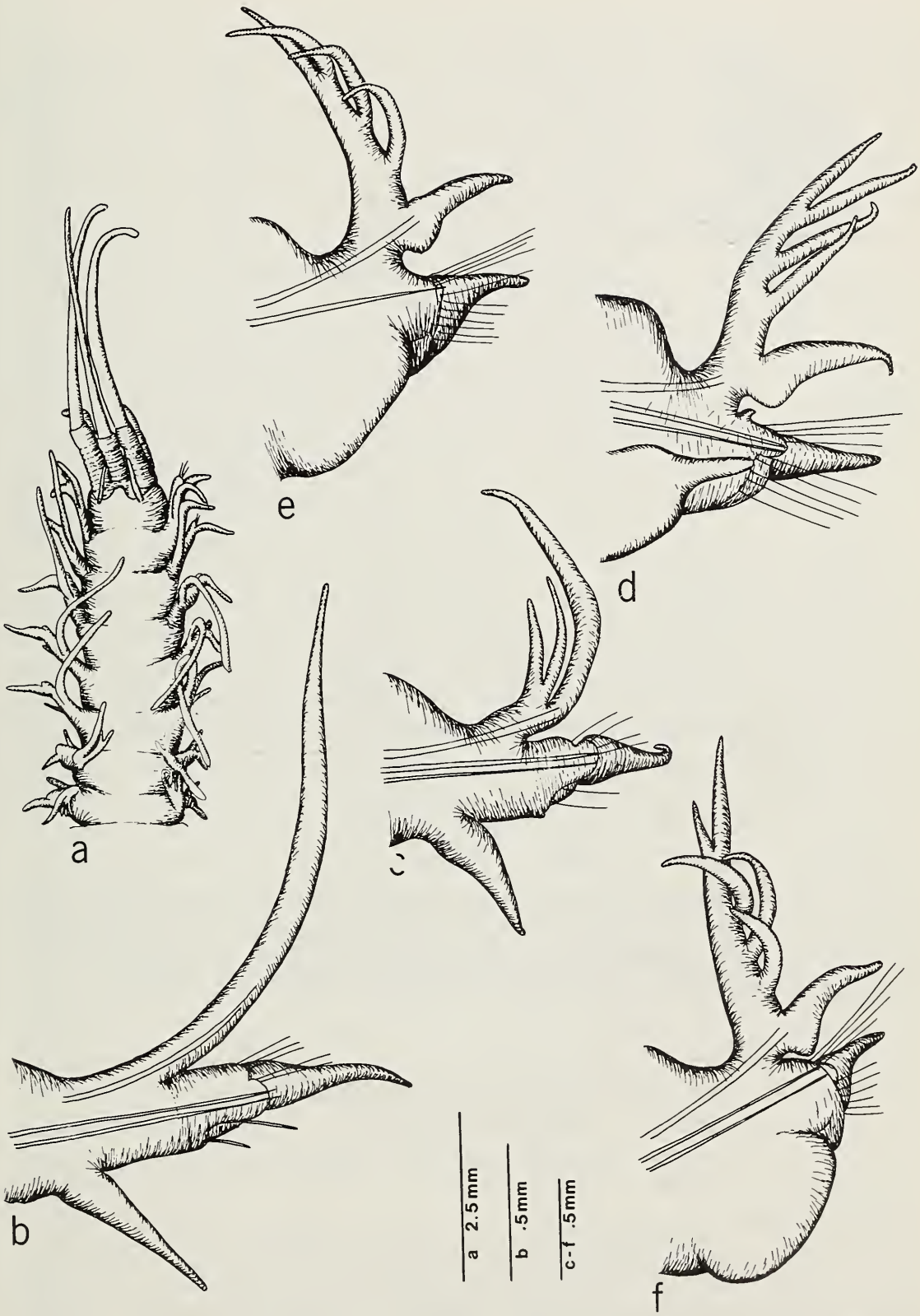

Fig. 3. *Onuphis* (*Onuphis*) *geminata* (holotype, USNM 61239): **a,** Anterior end, dorsal view; **b,** Parapodium from setiger 3, anterior view; **c,** Parapodium from setiger 6, anterior view; **d,** Parapodium from setiger 9, anterior view; **e,** Parapodium from setiger 12, anterior view; **f,** Parapodium from setiger 15, anterior view.

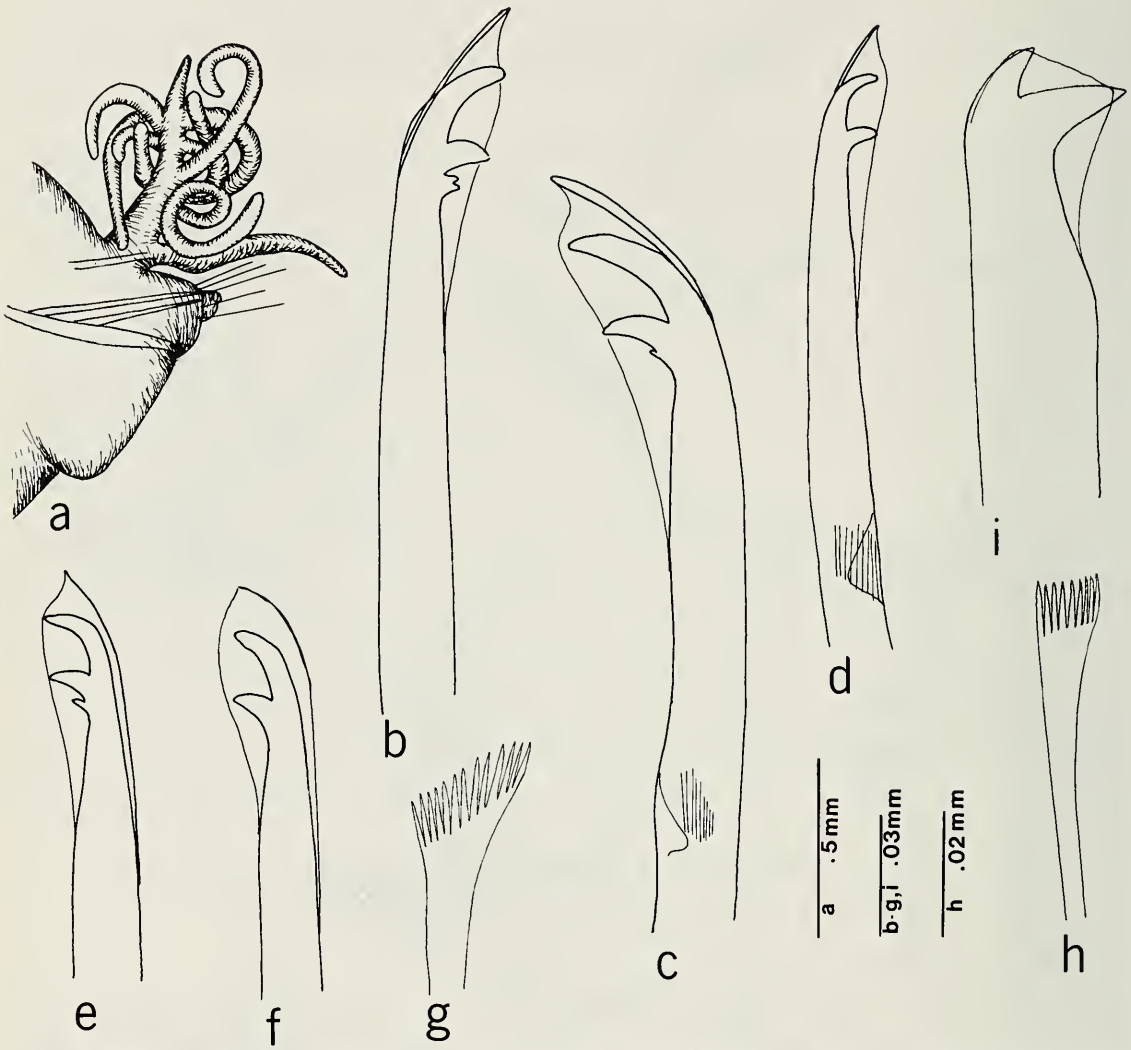

Fig. 4. *Onuphis* (*Onuphis*) *geminata* (holotype, USNM 61239): **a,** Parapodium from setiger 50, anterior view; **b–f,** Pseudocompound hooks; **b,** From setiger 3, upper hook; **c,** From setiger 3, median hook; **d,** From setiger 3, lowermost hook; **e,** From setiger 6, upper hook; **f,** From setiger 6, lowermost hook; **g,** Pectinate seta, setiger 50; **h,** Pectinate seta, setiger 3.

Onuphis (*Onuphis*) *geminata,* new species
Figs. 3–4, Table 4

Material examined.—CB-40A (holotype, USNM 61239, 2 paratypes, USNM 61240).

Description.—The holotype is an incomplete specimen that is 32 mm long for 81 setigers and 1.1 mm wide with parapodia. The anterior end is cylindrical and the posterior part of the fragment is dorsally flattened. All color patterns are dark brown except where specified. The frontal antennae are yellow; otherwise the prostomium is evenly light rose-colored. Most ceratophoral rings have narrow bands; the ceratostyles have speckled, irregular

markings. The peristomium has a band across the anterior edge on the dorsal side; setiger 1 lacks pigmentation, but from setiger 2 at least through setiger 50, each setiger has a narrow band across the dorsum at the anterior ⅓ of each segment. Setiger 3 has the most distinct of these bands, which become increasingly faint posteriorly; the band is broken up into 2 dorsolateral rows of patches for about 10 segments posterior to setiger 50. The whole ventrum, the parapodia and the remainder of the dorsum are evenly light rose- or flesh-colored and lack distinctive color patterns.

The prostomium (Fig. 3a) is a small, rounded lobe; the frontal antennae are nearly as long as the prostomium and spindle-shaped. The occipital antennae are disposed in a semicircle. The outer lateral ones reach setiger 2, with more than ½ their length in the ceratophore. The inner lateral and median occipital antennae reach setiger 6. Each ceratophore has 9–10 rings of which the distalmost one is about as wide as 3 of the other rings combined. The peristomium is about as long as the first setiger and carries a pair of slender peristomial cirri on its frontal margin.

The first parapodia are no larger than those of the next several setigers and similar in shape. Each (Fig. 3b) has a flattened, rather wide base. The acicular lobe is distally rounded; the superior half of the presetal lobe follows the acicular lobe closely; the inferior half projects beyond the acicular lobe as a rounded, flattened flap with a distinct excision on the inferior edge. The dorsal cirri in the first 5 setigers are extremely long and slender and at setiger 3 (Fig. 3b) are at least twice as long as the whole parapodium from the base to the tip of the acicular lobe. The postsetal lobes are about as long as the parapodial bases and are spindle-shaped. The ventral cirri are attached near the base of the parapodia; each tapers evenly to a fine point. The dorsal cirri rapidly decrease in length posteriorly (Figs. 3b–f, 4a) and develop distinct swellings near the base. At setiger 9 (Fig. 3d) each dorsal cirrus is about as long as the postsetal lobe and rather similar in shape. Ventral cirri are cirriform through the first 9 setigers and are pad-shaped thereafter. In setigers 8 and 9 the tip of the ventral cirrus is distinctly on the anterior face of the parapodia and the pads that replace the ventral cirri are placed on the anterior face of the parapodia (Figs. 3e–f). Postsetal lobes remain well developed in all parapodia present. A small, distinct cirrus is present on the superior edge of the parapodium near the base of the dorsal cirrus in setiger 9.

Limbate setae, pectinate setae, pseudocompound and subacicular hooks are present. Large hooks and compound spinigers are absent. Limbate setae are present in all setigers, but are especially numerous in setigers 8–25. Two different groups of pectinate setae are present. Setigers 2–6 have narrow, distally transverse setae with about 8 teeth (Fig. 4h). Pectinate setae are absent in setigers 7 through about setiger 18. From about setiger 18 another kind is present; each (Fig. 4g) is distally oblique and has about 12 teeth.

Pseudocompound hooks are present in the first 7 setigers. Most of the hooks (Fig. 4b, c, e) are tridentate with 2 distal teeth of about the same size and the third tooth reduced and closely appended to the second one. In a few hooks, the lower tooth appears bifid (Fig. 4b). In addition, a single bidentate hooks (Figs. 4d, f) with subequal teeth is present inferiorly in each fascicle. Subacicular hooks are first present in setiger 23; each (Fig. 4i) is bidentate.

Branchiae are first present from setiger 6 (Fig. 3e) and are bifurcated from the first. Maximum number of branchial filaments is 8 or 9. The filaments are arranged as a series of lateral filaments on a main branchial stem in all setigers (Figs. 3d–f, 4a), but in median and posterior setigers the branchial stem becomes increasingly short compared to the length of the lateral filaments. In addition the filaments tend to curl up, so the branchiae may appear superficially as tufted filaments rather than the pectinate arrangement actually present.

The jaws are well sclerotized; the maxillary formula is 1+1, 7+8, 6+0, 6+7 and 1+1 in one of the paratypes.

Only two of the three specimens could be examined in detail; the third specimen clearly belongs to the same species in terms of color pattern and the structure of the branchiae, but the anterior end is regenerating so no valid counts or measurements could be made.

Tubes are delicate with a thin, flimsy inner lining, sparsely covered with sand grains.

Remarks.—O. geminata is here compared (Table 4) to other species with branchiae first present from about setiger 6 and without simple hooks in anterior setigers.

O. zebra Berkeley and Berkeley (1939:337–338, figs. 9–10) differs from all other species in this group by having compound spinigers in anterior setigers and subacicular hooks are absent; the holotype consists of only 35 setigers (USNM 32898); hooks may be present in other members of the species.

O. acapulcensis Rioja (1944:139–143, figs. 1–11), *O. cedroensis* Fauchald (1968:31–34, pl. 8, figs. a–g), *O. multidentata* Hartmann-Schröder (1960:24–26, figs. 50–55), *O. nannognathus* Chamberlin (1919:270–274, pl. 43, figs. 8–11, pl. 44, figs. 1–5), *O. oligobranchiata* Orensanz (1974:93–94, pl. 6), *O. pourtalesii* (Ehlers, 1879:273, see also Ehlers, 1887:74–75, pl. 19, figs. 6–10, pl. 20, figs. 1–6), *O. proalopus* Chamberlin (1919:265–269, pl. 40, figs. 3–8, pl. 41, figs. 1–10), *O. profundi* Fauchald (1968:40–41, pl. 10), *O. similis* Fauchald (1968:28–29, pl. 4, figs. g–i), *O. lineata,* new name (for *O. striata* Hartmann-Schröder, 1965:164–167, figs. 135–137, see below) and *O. tenuis* Hansen (1882:10, pl. 3, figs. 15–22, see also Orensanz, 1974:87–89, pl. 3) all have exclusively tridentate pseudocompound hooks; other species in this group have both bi- and tridentate hooks. Of these, *O. dorsalis* (Ehlers, 1897:71–74, pl. 5, figs. 108–118, see also Hartmann-Schröder, 1962:114–117, figs. 115–119) and *O. heterouncinata* (Hartmann-Schröder, 1965:161–164,

figs. 132–134) have subacicular hooks first present on setigers 14 and 12 respectively. *O. dorsalis* has 3 branchial filaments and *O. heterouncinata* a single filament per segment (thus, by definition, a member of the subgenus *Nothria,* but with so great similarities to species of the subgenus *Onuphis* that it is considered here for the sake of completeness). *O. geminata* and *O. investigatoris* Fauvel (1932:147–148, pl. 6, figs. 1–6, textfig. 21), the two remaining species in the group, have at least 8 branchial filaments where the branchiae are best developed. *O. geminata* has subacicular hooks starting at setigers 23; the start of the subacicular hooks is not stated in Fauvel (1932), but judging from his Plate 6, figs. 4 and 5, they must start posterior to setiger 10 and anterior to setiger 30. It is here assumed that *O. geminata* cannot be separated from *O. investigatoris* on this character. The two species can be separated on the structure of the occipital antennae. The inner lateral occipital antennae are at least twice as long as the median one in *O. investigatoris* and reach setiger 15; in *O. geminata* these 3 antennae are of about the same length and reach setiger 6. There are also minor differences in the distribution of cirriform ventral cirri, pseudocompound hooks and in the number of branchial filaments as indicated in Table 4. Additionally, *O. geminata* is oculate, *O. investigatoris* is not.

O. geminata is known from a single locality in *Thalassia* and fine sand in a mangrove area about 10 km north of the city of Dangriga, Belize.

Etymology.—The specific name, Latin for twinned, refers to the close similarity between this and other species of the genus in Belize.

Onuphis (*Onuphis*) *lineata,* new name
Table 4

Onuphis striata Hartmann-Schröder, 1965:164–167, figs. 135–137.

Material examined.—Off Chile (holotype, Hamburg Staatsmuseum, P-14293).

Remarks.—The specimen is as described by Hartmann-Schröder (1965). Pseudocompound hooks are present in the first 7 setigers and postsetal lobes are distinct in the first 50 setigers. Branchiae are present from setiger 6 at least through setiger 99; an additional 30 setigers are present in the type, but are in recent regeneration and lack branchiae.

The name *O. striata* is preoccupied in the combination *O. striata* Ushakov (1950), originally described as *Onuphis parva striata* Ushakov, (1950:193, fig. 25, see also Ushakov, 1955:235–236, fig. 74B and 77J). Fauchald (1968:37) elevated Ushakov's subspecies to separate specific status. Hartmann-Schröder (in litt.) requested that a new name be given her taxon from Chile.

O. lineata is known from the type-locality only.

Etymology.—The specific name, Latin meaning (in part) striped, was se-

lected to parallel as closely as possible the meaning of the name initially used for this taxon; both names refer to the presence of numerous narrow transverse bands of dark brown pigment across the dorsum in anterior setigers.

Onuphis (*Onuphis*) *pulchra*, new species
Figs. 5–6, Tables 5, 6

Material examined.—CB-1 (holotype, USNM 61241; 58 paratypes, USNM 61242); CB-16 (45); F-19 (13); F-21 (3); F-28 (7); F-33 (1).

Description.—The holotype is a complete specimen with 240 setigers that is 70 mm long and 1.3 mm wide including parapodia. The anterior part of the body, including the 5 first setigers is cylindrical. Posterior to setiger 6 the body becomes increasingly flattened dorsally and the ventrum convexly curved, creating a space above the animal in the tube. The complex color pattern consists of dark brown pigment rings and patches. The prostomium and peristomial rings lack color patterns. Each of the outer lateral ceratostyles has a narrow ring near the base; the remaining occipital antennae lack color patterns. There is a broad band across the posterior half of the first setiger, darkening distinctly towards the intersegmental groove to the second setiger. The anterior half of the first setiger appears translucently white (due to the presence of a field of epidermal glands). Each setiger back to about setiger 30 has a transverse band at the posterior edge. These bands become reduced medially at about setiger 30 and become interrupted into two rows of dorsolateral transverse patches at about setiger 30. These two rows are continued posteriorly for about 10 more setigers. Each dark band is bordered anteriorly by a narrow translucent band of epidermal glands; these bands disappear at about setiger 30. The ventrum and the rest of the body are evenly light rose-colored in alcohol and lack distinct color pattern. The color pattern is as described also in live specimens.

The prostomium (Fig. 6a) is nearly circular and has a pair of short, triangular frontal antennae. The outer lateral occipital antennae barely reach the posterior edge of the peristomium; in most individuals they are curved anteroventrally. Each has a spindle-shaped style and a short ceratophore with 4 rings. The inner lateral occipital antennae reach setiger 4–5; the median one reaches setigers 3–5 in most specimens (see Table 5); each has

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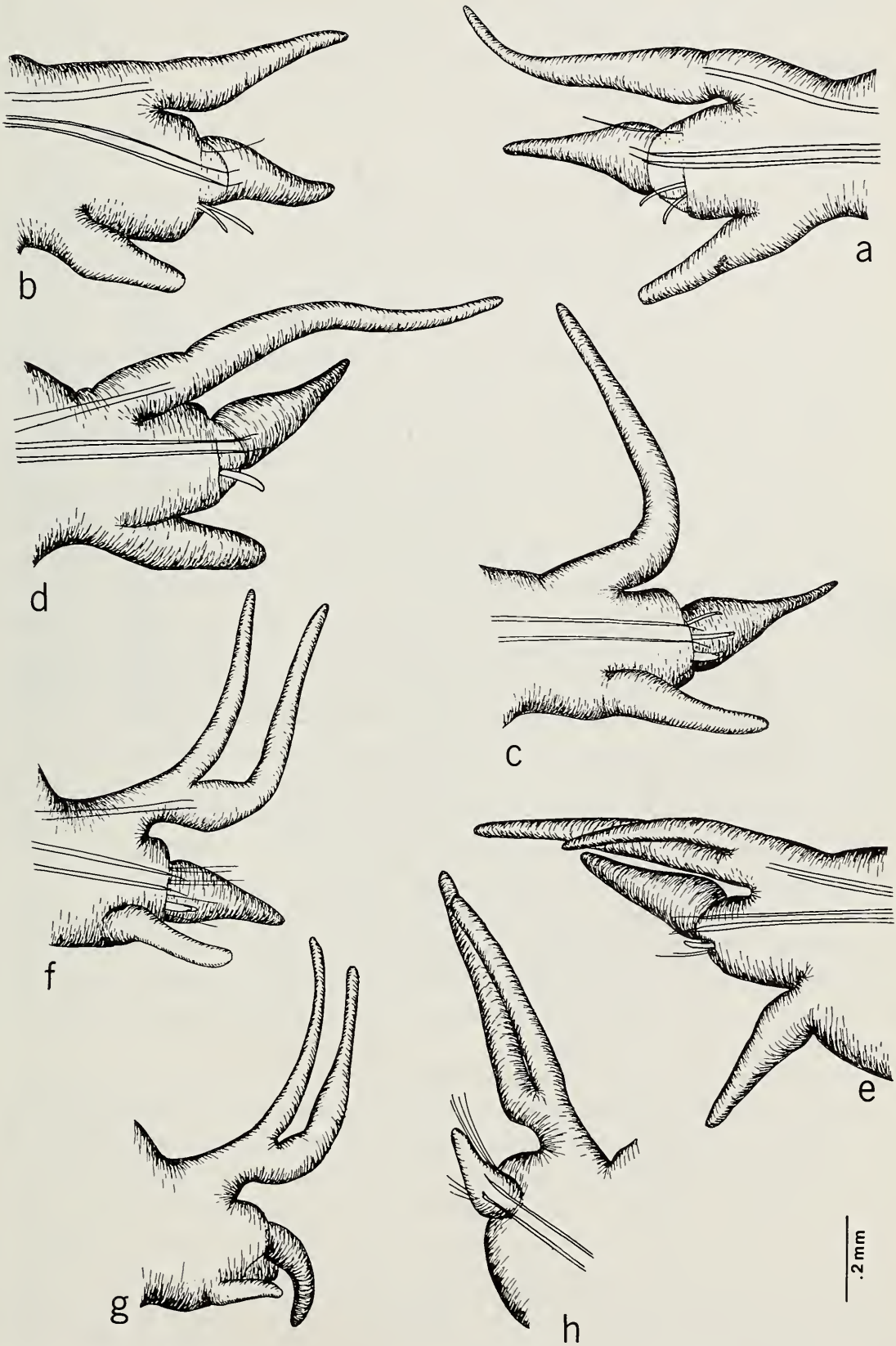
Fig. 5. *Onuphis* (*Onuphis*) *pulchra* (holotype, USNM 61241); **a,** Parapodium from setiger 1, anterior view; **b,** Parapodium from setiger 2, anterior view; **c,** Parapodium from setiger 4, anterior view; **d,** Parapodium from setiger 5, anterior view; **e,** Parapodium from setiger 6, anterior view; **f,** Parapodium from setiger 7, anterior view; **g,** Parapodium from setiger 8, anterior view; **h,** Parapodium from setiger 12, posterior view.


a
b
c
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e
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.2 mm

a short ceratophore with 4 to 5 rings of which the distalmost one makes up about one-half of the length of the ceratophore. The peristomial cirri are attached at the anterior edge of the peristomial rings; each is spindle-shaped and reaches just beyond the bases of the occipital antennae. A pair of black eyespots are present between the bases of the outer and inner lateral occipital antennae.

The first few parapodia (Fig. 5a) are attached laterally. The first projects anteriorly; each ramus is about as long as the body is wide. The presetal lobe has a rounded distal edge with a distinct excision on the ventral side. A contraction fold can be present across the parapodium at the base of the presetal lobe. The acicular lobe is rounded. The postsetal lobe is about as long as the base of the parapodium and is spindle-shaped. The dorsal cirrus is distinctly longer than the postsetal lobe and reaches well beyond all other parapodial parts and is spindle-shaped. The ventral cirrus is digitate and reaches the tip of the acicular lobe. The second and third parapodia (Fig. 5b) are similar in shape, except that the parapodial bases are shorter and relatively wider than that of the first parapodium. In the fourth and fifth parapodium (Figs. 5c–d) the acicular lobes become increasingly wider and distally more truncate than that of the first one. The presetal lobes are flattened to follow the outline of the acicular lobe closely. The dorsal cirri are longer compared to the other parapodial parts and the ventral cirri become shorter and are placed on the anterior face of each parapodium. The ventral cirri are cirriform through setigers 9–10 (Figs. 5e–g, Table 5). Dorsal cirri are present in all setigers to the posterior end; they become increasingly slender posteriorly but are of about the same length as those in the anterior setigers. Postsetal lobes (Fig. 5h) can be recognized in the first 50 setigers as a distinct digitiform lobe on the distal end of a low, rounded fold that closely follows the outline of the acicular lobe.

Branchiae are first present from setiger 6 (Table 5); the first 10 setigers have a single branchial filament; thereafter, the numbers increase to 3 or 4; the branchiae again become single filaments at about setigers 70–100 (approximately $^1/_2$ the length of the specimen) and the last $^1/_5$ of the length of each specimen lacks branchiae.

Limbate and pectinate setae, two kinds of anterior hooks and subacicular hooks are present. Limbate setae are most common in the first 50 setigers. Pseudocompound tridentate hooks (Fig. 6b–h) are present in the first 6 setigers. Each has a blunt hood and the teeth are curved and slender, decreasing more or less evenly in size from the distal to the proximal tooth. Large tridentate hooks (Fig. 6k–n) are present from setiger 4 to the last segment before the start of the subacicular hooks. Each large hook is at least twice as heavy as the pseudocompound hooks of the same segment; the median tooth is larger than the distal one in all large hooks. The median tooth becomes increasingly curved and the distal tooth more erect posteriorly

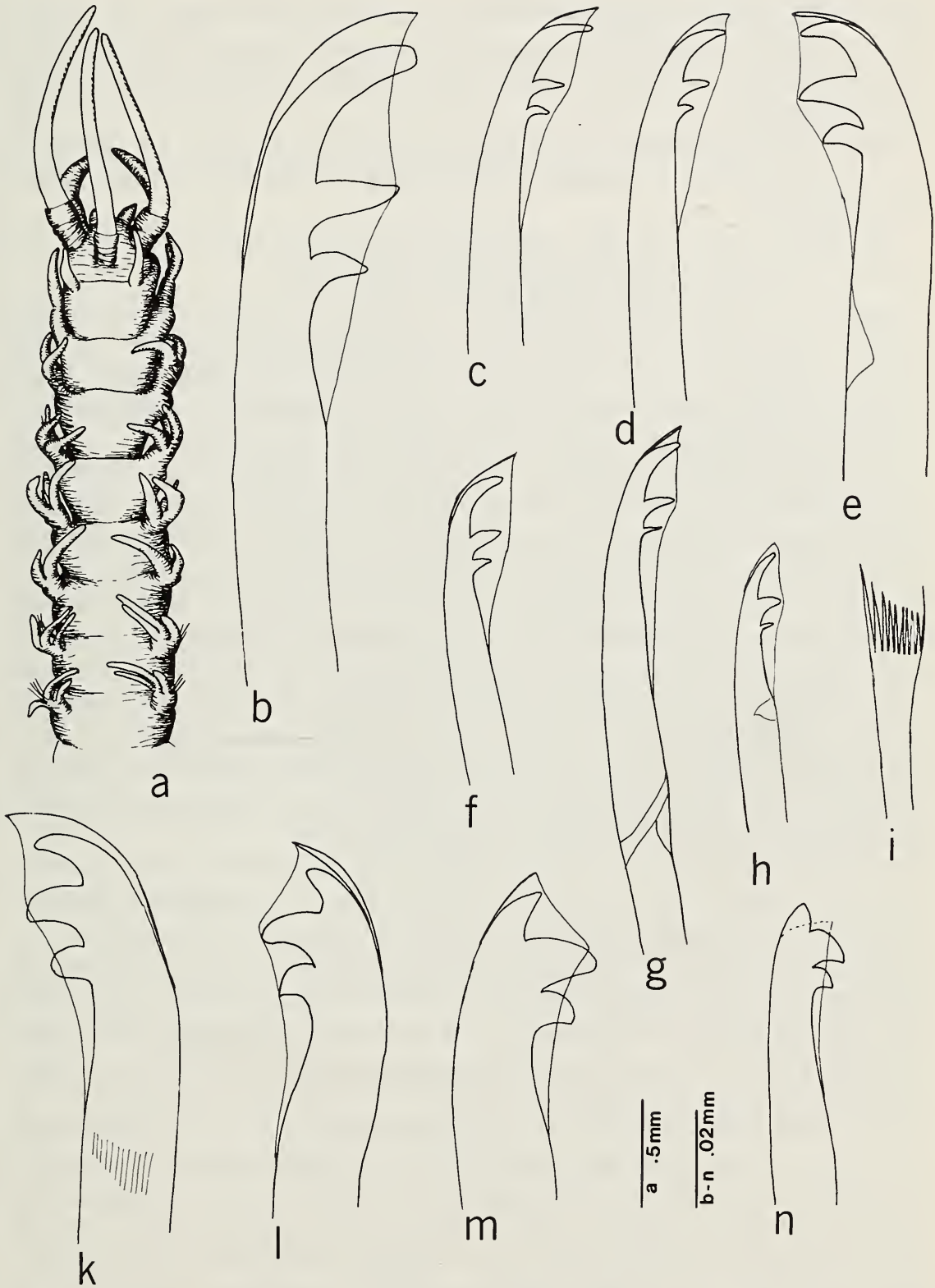

Fig. 6. *Onuphis* (*Onuphis*) *pulchra* (holotype, USNM 61241): **a,** Anterior end, dorsal view, **b–h,** Pseudocompound hooks; **b,** From setiger 1; **c,** From setiger 2; **d–e,** From setiger 3; **f,** From setiger 4; **g,** From setiger 5; **h,** From setiger 6; **i,** Pectinate seta, from setiger 3; **k–n,** Large hooks; **k,** From setiger 4; **l,** From setiger 5; **m,** From setiger 6; **n,** From setiger 12.

(Fig. 6n). Bidentate subacicular hooks are present from setigers 16–20 (Table 5); usually 2 hooks are present in a segment. Pectinate setae (Fig. 6i) are present from the second setiger; each is slightly oblique distally and has about 12 teeth.

The maxillary formula is 1+1, 6–7+8, 8+0, 5-6+8 and 1+1 as observed by dissection of four paratypes. The whole jaw-apparatus is poorly sclerotized and soft.

The tubes have a tough, translucent inner lining and are densely and evenly covered with shell-fragments and coral debris.

Remarks.—The relations between *O. pulchra, O. virgata* (see below) and related taxa can best be clarified by discussing them jointly. Table 6 surveys species of *Onuphis* with branchiae first present from about setiger 6 and with large tridentate hooks in some anterior setigers, in addition to the pseudocompound hooks present in all species of the genus.

O. fragilis Kinberg (1865:561, see also Kinberg, 1910:40, pl. 15, fig. 11 and above) has smooth occipital ceratophores; all other species have distinctly ringed ceratophores. Three species, *O. jenneri* Gardiner (1976:192–193, fig. 24o–t), *O. microcephala* Hartman (1944a:78–80, pl. 3, figs. 67–75, pl. 18, fig. 339, see also Gardiner, 1976:191–192, fig. 24k–n) and *O. pigmentata* Fauchald (1968:38–39, pl. 9, figs. f–n) have pad-shaped ventral cirri from setiger 3; the other species have cirriform ventral cirri through at least setiger 4. *O. taeniata* Paxton (1979:284–288, figs. 43–55) and *O. vermillionensis* Fauchald (1968:41–43, pl. 11) have large hooks through setiger 10, the remaining three species, *O. setosa* Kinberg (1865:560, see also Kinberg, 1910:40, pl. 14, fig. 10 and Orensanz, 1974:89–93, pls. 4–5) and the two new species have large hooks at least through setiger 13.

It is difficult to define *O. setosa* precisely in relation to the two new species. It differs from *O. pulchra* in that it has fewer segments with cirriform ventral cirri and fewer segments with pseudocompound hooks. Orensanz (1974:89–93) indicated the range of variation of these features he found in *O. setosa,* but one cannot determine from Orensanz's description how this variability is distributed. The two species differ clearly in color patterns in that *O. setosa* has dark pigment bands on both pro- and peristomium according to Orensanz (1974:89, pl. 4, fig. 1); all specimens of *O. pulchra* lack pigment on both pro- and peristomium. *O. setosa* differs from *O. virgata* in that it has 4 to 8 setigers with cirriform ventral cirri and 4 to 5 setigers with pseudocompound hooks; *O. virgata* has 11–13 setigers with cirriform ventral cirri and 7 setigers with pseudocompound hooks. *O. pulchra* has pseudocompound hooks in 6 setigers and cirriform ventral cirri in 9 to 10 setigers. *O. virgata* has color patches and bands on the pro- and peristomium; *O. pulchra* lacks such color patterns. The numerical differents appear minor, but are statistically different (chi squared, at the .01 level,

even if the sample of *O. virgata* is too small for strict application of any statistical tests).

O. pulchra is very common in *Thalassia*-flats in shallow water near Carrie Bow Caye, Belize.

Etymology.—The specific name, Latin meaning pretty or beautiful, refers to the striking color pattern of the anterior end.

Onuphis (*Onuphis*) *virgata,* new species
Fig. 7, Tables 6, 7

Material examined.—CB-40A (1 specimen); CB-40B (holotype, USNM 61248, 3 paratypes, USNM 61249).

Description.—The holotype is an incomplete specimen with 149 setigers that is 57 mm long and .7 mm wide with parapodia. The anterior end, including the 5 first setigers, is cylindrical, median and posterior parts of the body are dorsally flattened and the parapodia become increasingly dorsolateral in position. A distinct color pattern of dark brown bands and patches is present on the anterior end of the body. A narrow band is at the base of all ceratostyles and a large dark patch is on the prostomium in front of the occipital antennae. The peristomium has a wide band across the dorsum and the first setiger is evenly light brown with a darker band across the posterior half on the dorsal side only. The next dozen or so segments have dark bands across both dorsum and ventrum. The pigment bands on the ventrum rapidly fade posteriorly and are absent after setiger 20. The dorsal pigment bands break up into dorsolateral patches which continue to about setiger 50. Each of the first 5 or 6 pairs of parapodia has a dark patch near the distal end of the acicular lobe on the posterior face. The rest of the body is pale pink-colored.

The prostomium (Fig. 7f) is frontally rounded and has the occipital antennae attached in a semicircle; the frontal antennae are narrowly triangular. The outer lateral occipital antennae barely reach the posterior edge of the peristomial rings. The inner lateral and median occipital antennae reach about the middle of setiger 3; each ceratophore has about 4 rings of which the distalmost is longer than the 3 others combined. The peristomial rings are about half as long as the first setiger; the anteriormost carriers a pair of short, slender peristomial cirri on the frontal edge.

The first parapodia are directed forward and ventrally; they are of about the same size as those of the second and third setiger. Each (Fig. 7a) has a wide, antero-posteriorly flattened base; there may be a contraction fold across the anterior face of each parapodium at the level of the bases of the dorsal and ventral cirri (not shown in the illustration). The presetal lobe is obliquely rounded and is distinctly excised on the ventral side. The acicular

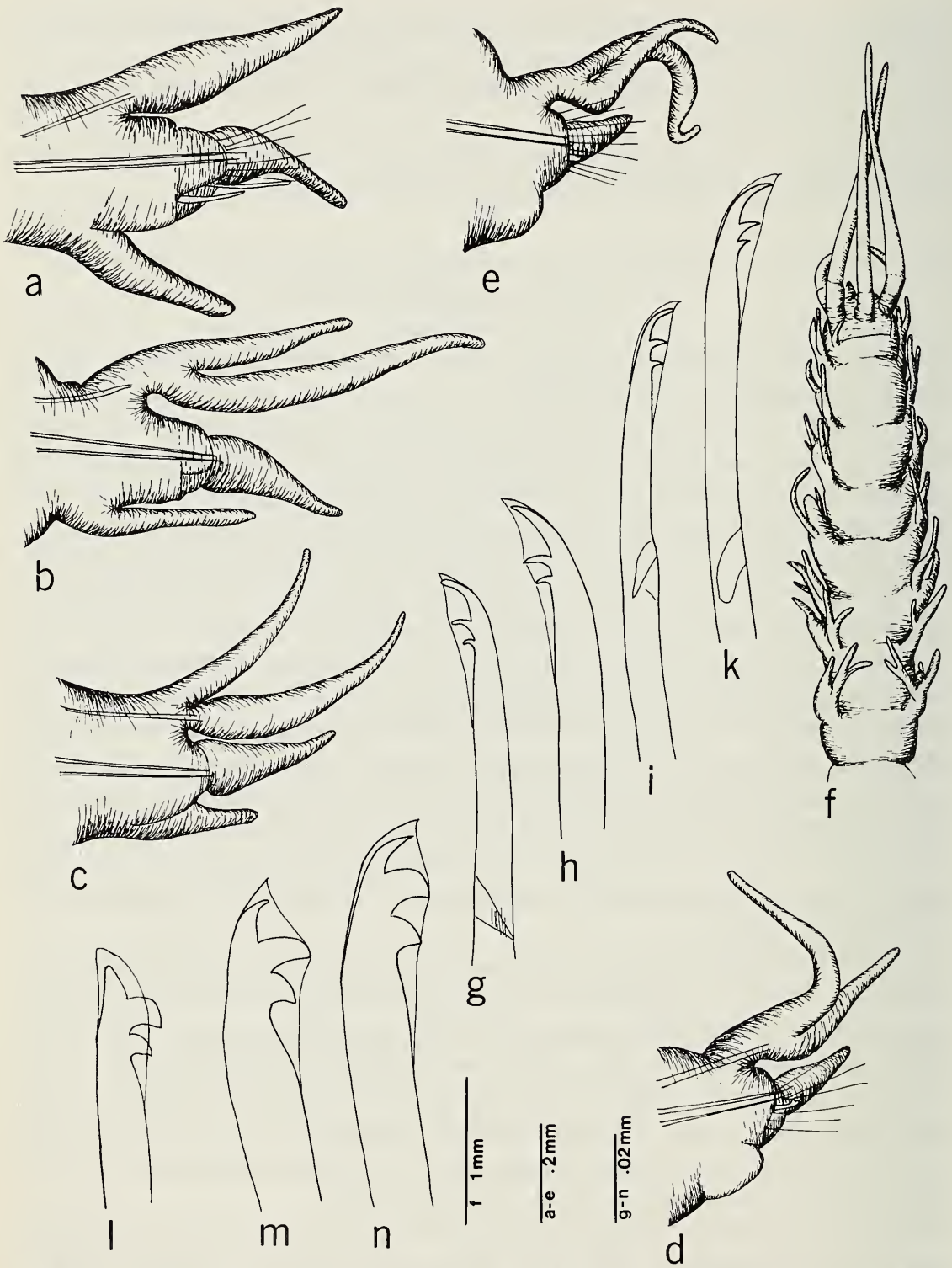

Fig. 7. *Onuphis* (*Onuphis*) *virgata* (holotype, USNM 61248): **a,** Parapodium from setiger 3, anterior view; **b,** Parapodium from setiger 6, anterior view; **c,** Parapodium from setiger 9, anterior view; **d,** Parapodium from setiger 15, anterior view; **e,** Parapodium from setiger 18, anterior view; **f,** Anterior end, dorsal view; **g–k,** Pseudocompound hooks, **g,** From setiger 3; **h,** From setiger 6; **i–k,** From setiger 7 of a paratype; **l–n,** Large hooks, **l,** From setiger 12; **m,** From setiger 6; **n,** From setiger 7 of a paratype.

lobe is evenly rounded. The postsetal lobe is spindle-shaped and is about as long as the base of the parapodium. The dorsal cirrus is digitate; it is shorter than the postsetal lobe. The ventral cirri remain cirriform through about 12 setigers (see Tables 6 and 7); they decrease in size from the first setiger (Fig. 7a–e) and move on to the anterior face of each parapodium from about setiger 9. The postsetal lobes remain distinct in all segments in the fragments available (of which the holotype is the longest), but decrease rapidly in size at about setigers 20–25; they are short, digitate extensions from the middle of a wide, rounded lobe in all posterior setigers. The dorsal cirri become somewhat more slender in posterior setigers, but remain about the same length.

Branchiae are first present from setigers 6–7 (Table 7); the first branchia is a single filament, more posteriorly the branchial filaments increase to about 5. The number of filaments decrease in more posterior segments; in all specimens examined the branchiae have at least 2 filaments, even on the last setigers present.

Limbate and pectinate setae, pseudocompound, large and subacicular hooks are present. Limbate setae are present in most setigers, but are densest in anterior setigers; pectinate setae are present from about the third setiger; each has a transverse distal margin with about 8 teeth. Pseudocompound hooks (Figs. 7g–k, Table 7) are present in the first 7 setigers. Each is slender and has 3 slender teeth; the hoods are short and distally blunt. The teeth decrease rather evenly in size from the distalmost one. Large hooks (Figs. 7l–n) are present from setiger 4 through about setiger 21; each is at least twice as thick as the pseudocompound hooks of the same segment, and tridentate; the distal tooth is short and slender and is erect in at least the last 10 segments. Bidentate subacicular hooks are present from about setiger 22. There are no segments with both large and subacicular hooks. Compound spinigers are absent.

The maxillary formula is 1+1, 7+9, 7+0, 5+9 and 1+1 as examined in one paratype. The jaw-apparatus is well sclerotized. The teeth on left maxilla IV are unusually long and slender.

The tubes have a thin inner lining and are covered with fine sand-grains.

The relationships between *O. virgata* and similar species have been discussed above.

O. virgata is known from an area about 10 km North of the city of Dangriga, Belize, in *Thalassia* and fine sand in mangroves.

Etymology.—The specific name, Latin meaning (in part) colored stripes, refers to the striking color pattern of this species.

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Literature Cited

Andrews, E. A. 1891a. Reproductive organs of *Diopatra*.—J. Morph. Philadelphia 5:113–124.

———. 1891b. Report upon the Annelida Polychaeta of Beaufort, North Carolina.—Proc. U.S. Natl. Mus. 14:277–302.

Augener, H. 1906. Reports on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico and the Caribbean Sea, and on the east coast of the United States, 1877 to 1880, by the U.S. Coast Survey Steamer *Blake*. Westindische Polychaeten.—Bull. Mus. Comp. Zool. Harvard 43:91–196.

———. 1931. Die bodensässigen Polychaeten nebst einer Hirudinee der *Meteor*-Fahrt.—Mitt. Zool. Staatsinst. Hamburg 44:279–313.

Baird, W. 1870. Remarks on several genera of Annelides belonging to the group Eunicea, with a notice of such species as are contained in the collection of the British Museum and a description of some others hitherto undescribed species.—Jour. Linn. Soc. Zool. London 10:341–361.

Berkeley, E., and C. Berkeley. 1939. On a collection of Polychaeta, chiefly from the west coast of Mexico.—Ann. Mag. Nat. Hist. (11)3:321–346.

Bosc, L. A. G. 1802. Histoire naturelle des vers, contenant leur description et leur moeurs; avec figures dessinées d'après nature.—Paris 1:1–324.

Chamberlin, R. V. 1919. The Annelida Polychaeta.—Mem. Mus. Comp. Zool. Harvard 48:1–514.

Day, J. H. 1967. A monograph on the Polychaeta of Southern Africa. Part I. Errantia.—British Museum (Natural History) Publication 656:XXXVIII and 458 pp.

———. 1973. New polychaeta from Beaufort, with a key to all species recorded from North Carolina.—Natl. Ocean. Atmos. Adm. Tech. Rep. Natl. Mar. Fish. Serv. Circ. 375, 140 pp.

Ehlers, E. 1879. Reports on the results of dredging under supervision of Alexander Agassiz, in the Gulf of Mexico, by the United States Coast Survey steamer *Blake,* Lieutenant-Commander C. D. Sigesbee, U.S.N. commanding. Preliminary report on the worms.—Bull. Mus. Comp. Zool. Harvard 5:269–274.

———. 1887. Report on the annelids of the dredging expedition of the U.S. Coast Survey steamer *Blake*.—Mem. Mus. Comp. Zool. Harvard 15: VI and 335 pp.

———. 1897. Polychaeten. Hamburger Magalhaenischen Sammelreise. Hamburg. Friedrichsen & Co. 148 pp.

Fauchald, K. 1968. Onuphidae (Polychaeta) from western Mexico.—Allan Hancock Monogr. Mar. Biol. 3, 82 pp.

———. 1972. Benthic polychaetous annelids from deep water off western Mexico and adjacent areas in the eastern Pacific Ocean.—Allan Hancock Monogr. Mar. Biol. 7. 575 pp.

———. 1973. Polychaetes from central American sandy beaches.—Bull. So. California Acad. Sci. 72:19–31.

———. 1977. Polychaetes from intertidal areas in Panama, with a review of previous shallow-water records.—Smithsonian Contr. Zool. 221. 81 pp.

Fauvel, P. 1923. Polychètes errantes. Faune de France 5. 488 pp.
———. 1932. Annelida Polychaeta of the Indian Museum, Calcutta.—Mem. Indian Mus. Calcutta 12(1):1–262.
Gardiner, S. L. 1976. Errant polychaete annelids from North Carolina.—Jour. Elisha Mitchell Sci. Soc. (Fall, 1975) 91(3):77–220.
Hansen, G. A. 1882. Recherches sur les Annélides recueillies par M. le professeur Eduard van Beneden pendant son voyage au Brésil et à la Plata.—Mém. Acad. Roy. Sci. Belg. Bruxelles 44. 29 pp.
Hartman, O. 1938. Annotated list of the types of polychaetous annelids in the Museum of Comparative Zoology.—Bull. Mus. Comp. Zool. Harvard 85:1–31.
———. 1942. Polychaetous annelids. Report on the scientific results of the *Atlantis* expditions to the West Indies under the joint auspices of the University of Havana and Harvard University.—Mem. Soc. Cubana Hist. Nat. 16(2):89–104.
———. 1944a. Polychaetous annelids. Part 5. Eunicea.—Allan Hancock Pacific Exped. 10(1), 238 pp.
———. 1944b. Polychaetous annelids.—Allan Hancock Atlantic Exped. Report 3, 33 pp.
———. 1945. The marine annelids of North Carolina.—Bull. Duke Univ. Mar. Sta. 2, 54 pp.
———. 1951. The littoral marine annelids of the Gulf of Mexico.—Publ. Inst. Mar. Sci. Texas 2:7–124.
———. 1968. Atlas of errantiate polychaetous annelids from California.—Allan Hancock Foundation, University of Southern California, Los Angeles, 828 pp.
Hartmann-Schröder, G. 1960. Zur Polychaeten-Fauna von Peru. Part 1.—Beitr. Neotrop. Fauna 2:1–44.
———. 1962. Die Polychaeten des Eulitorals. *In* Hartmann, G. and G. Hartmann-Schröder: Zur Kenntnis der Eulitorals der chilenischen Pazifikküste und der argentinischen Küste Südpatagoniens unter besonderer Berücksichtigung der Polychaeten und Ostracoden.—Mitt. Hamburg Zool. Inst. u. Mus. Erg. B. zu 60:57–167.
———. 1965. Die Polychaeten des Sublitorals. *In* Hartmann, G. and G. Hartmann-Schröder: Zur Kenntnis des Sublitorals der chilenischen Küste unter besonderer Berücksichtigung der Polychaeten und Ostracoden (Mit Bemerkungen über den Einfluss sauerstoffarmer Strömungen auf die Besiedlung von marinen Sedimenten).—Mitt. Hamburg Zool. Inst. u. Mus. Erg. B. zu 62:59–305.
Kinberg, J. G. H. 1865. Annulata nova.—Öfv. Vet. Akad. Stockholm Förh. 21:559–574.
———. 1910. Zoologi 3. Annulata.—Kongliga Svenska Fregatten *Eugenies* Resa omkring jorden under befäl af C. A. Virgin åren 1851–1853. Vetenskapliga Iagttagelse på Konung Oscar den Förstes befallning utgifna delen. Almquist o. Wicksells, Stockholm. 78 pp.
Kiseleva, M. J. 1968. Policheti sublitorali tsentralino-Amerikanskikh Morei. Otvyid Eunicemorpha.—Issled. Tstentralino-Amerikanskikh Morei. Akad. Nauk. Biol. St. Sevastopol 2:75–98.
McIntosh, W. C. 1885. Report on the Annelida Polychaeta collected by H.M.S. *Challenger* during the years 1873–76.—Challenger Reports 12, 554 pp.
Monro, C. C. A. 1928. On the Polychaeta collected by Dr. Th. Mortensen off the coast of Panama.—Vidensk. Medd. dansk naturh. Foren. 85:75–103.
———. 1933. The Polychaeta Errantia collected by Dr. C. Crossland at Colón in the Panama region and the Galapagos Islands during the expedition of the S.Y. *St. George*.—Proc. Zool. Soc. London 1933 (1):1–96.
Orensanz, J. M. 1974. Los anelidos poliquetos de la provincia biogeografica Argentina, V: Onuphidae.—Physis, Argentina Sec. A 33(86):75–122.
Paxton, H. 1979. Taxonomy and aspects of the life history of Australian beachworms (Polychaeta: Onuphidae).—Australian Jour. Mar. Freshwater Res. 30:265–294.
Pearse, A. S. 1936. Estuarine animals at Beaufort, North Carolina. Jour. Elisha Mitchell Sci. Soc. 52:174–222.

Pettibone, M. H. 1963. Marine polychaete worms of the New England region. 1. Aphroditidae through Trochochaetidae.—Bull. U.S. Natl. Mus. 227(1), 356 pp.

Rioja, E. 1944. Estudios anelidologicos XI. Notas sobre algunas especies de poliquetos de las costas mexicanas del Pacifico.—Anales Inst. Biol. Univ. México 15:139–145.

Rullier, F. 1974. Quelques annélides polychètes de Cuba recueillies dans les éponges.—Trav. Must. Hist. Nat. Gregore Antipa 14:9–77.

Suarez, A. M., and R. Fraga. 1978. Poliquetos bentosicos cubanos I.: Lista de poliquetos errantes.—Univ. Habana Cuba, Ciencias Ser. 8: Invest. Marinas 33. 60 pp.

Treadwell, A. L. 1921. Leodicidae of the West Indian region.—Pub. Carnegie Inst. Washington 293. 131 pp.

———. 1922. Polychaetous annelids collected at Friday Harbor, State of Washington in February and March, 1920.—Publ. Carnegie Inst. Washington 312:171–181.

———. 1934. New polychaetous annelids.—Smithsonian Misc. Coll. 91(8). 9 pp.

———. 1939. Polychaetous annelids of Porto Rico and vicinity.—Scientific Survey of Porto Rico and the Virgin Islands, New York Acad. Sci. 16(2):151–319.

Ushakov, P. V. 1950. Mnogoshchetinkovye chervei (Polychaeta) Okhotskoyo moreii.—Issled. Dalynevost. Morei SSSR 2:140–234.

———. 1955. Mnogshchetinkovye chervei dal'nevostochnykh morei SSSR.—Akad. Nauk, USSR. Keys to the Fauna of the USSR 56, 433 pp. (translated to English 1965).

Wilson, H. V. 1900. Marine biology at Beaufort.—Amer. Nat. N.Y. 34:339–360.

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Table 1.—Onuphidae (Polychaeta) previously reported from the Gulf of Mexico and Caribbean Sea. Some species (e.g. *Diopatra cuprea*) have been reported frequently from the U.S. Gulf coast; no attempts were made to include those records in the table.

Name	Record	Local depth distribution
Americonuphis magna (Andrews, 1891)	Treadwell, 1921 Hartman, 1951 Suarez and Fraga, 1978	Intertidal-shallow subtidal
Diopatra cuprea (Bosc, 1802)	Augener, 1906 Monro, 1933 Hartman, 1951 Fauchald, 1977 Suarez and Fraga, 1978	Intertidal to about 200 m
Hyalinoecia bilineata Baird, 1870	Rullier, 1974	Shallow subtidal
H. branchiata Treadwell, 1934	Treadwell, 1934 Treadwell, 1939 Suarez and Fraga, 1978	Deeper than 200 m
H. juvenalis Moore, 1911	Hartman, 1944b Kiseleva, 1968 Suarez and Fraga, 1978	Shallow subtidal

Table 1.—Continued.

Name	Record	Local depth distribution
H. tubicola (O. F. Müller, 1776)	Augener, 1906 Hartman, 1942 Hartman, 1951 Suarez and Fraga, 1978	Deeper than 200 m
H. varians Baird, 1870	Baird, 1870 Ehlers, 1887 Kiseleva, 1968 Suarez and Fraga, 1978	Shallow subtidal
Onuphis (Nothria) conchylega Sars, 1835	Augener, 1906 Kiseleva, 1968 Suarez and Fraga, 1978	Deeper than 200 m
O. (N.) opalina Verrill, 1873	Augener, 1906 Kiseleva, 1968 Suarez and Fraga, 1978	Deeper than 200 m
O. (N.) rubrescens Augener, 1906	Augener, 1906 Suarez and Fraga, 1978	Deeper than 200 m
O. (N.) sombreriana (McIntosh, 1885)	McIntosh, 1885 Suarez and Fraga, 1978	Deeper than 200 m
Onuphis (Onuphis) eremita Audouin and Milne Edwards, 1833	Kiseleva, 1968 Rullier, 1974 Suarez and Fraga, 1978	Shallow subtidal
O. (O.) eremita oculata Hartman, 1951	Hartman, 1951	Shallow subtidal
O. (O.) pourtalesii (Ehlers, 1879)	Ehlers, 1879 Ehlers, 1887 Augener, 1906 Hartman, 1938 Suarez and Fraga, 1978	Deeper than 200 m
O. (O.) vermillionensis Fauchald, 1968	Fauchald, 1977	Shallow subtidal
Paradiopatra fragosa Ehlers, 1887	Ehlers, 1887 Hartman, 1938	Deeper than 200 m
P. glutinatrix Ehlers, 1887	Ehlers, 1887 Augener, 1906 Hartman, 1938	Deeper than 200 m
Paronuphis gracilis Ehlers, 1887	Ehlers, 1887 Hartman, 1938	Deeper than 200 m
Rhamphobrachium agassizii Ehlers, 1887	Ehlers, 1887 Hartman, 1938 Treadwell, 1939 Kiseleva, 1968 Suarez and Fraga, 1978	Deeper than 200 m

Table 2.—Species of *Onuphis* (*Nothria*) with branchiae first present on or after setiger 10. *See comment in text, p. 807.

Name	# of rings ceratophores	Branchiae from setiger #	# of cirriform ventral cirri	# of setigers with pseudocomp. hooks	# of teeth in pseudocomp. hooks	# of setigers with large hooks	# of setigers with comp. spinigers	Subacicular hooks from setiger #	Color pattern
cirrata	6	17–18	6	5	3	—	8–12	13	dark bars
dangrigae	4–5	18–21	4–5	5	2 or 3	—	6–14	14–16	none
guadalupensis	none	22	3	3	2 or 3	—	4–11	12	dark bars
intermedia	4–5	25	5	3	3	—	4–13	14	?
rubrescens	7–9	14–18	5	?5	3	?	absent	?	solid dark
stigmatis	4	18–22	3	3–4	3	5	4–13	14–16	dark bars
veleronis	none	29–30	3	3	3	11	4–11	12	none
Orensanz's specimens*	none	10–21	3–4	3	3	4	4 or 5–13 or 15	14–16	dark bars

Table 3.—Comparison of distribution of certain variable features of *Onuphis (Nothria) dangrigae* and *O. (N.) stigmatis*. The numbers represent the means ± one standard deviation.

	Numbers examined	Branchiae from setiger #	Number of ventral cirri	# of setigers with pseudocomp. hooks	Subacicular hooks from setiger #
dangrigae	28	20.43 ± 1.93	5 (inv.)	4.54 ± .51	15.14 ± .76
stigmatis	24	19.42 ± 2.10	3.50 ± .51	3 (inv.)	14.46 ± .78

Table 4.—Species of *Onuphis* (*Onuphis*) with first branchiae from about setiger 6 and without simple (large) anterior hooks.

Name	Occipital antennae: Length of: i.l.	Occipital antennae: Length of: m.	Occipital antennae: # of rings	% of cirriform ventral cirri	Max. # of branchial fil.	Pseudocompound hooks: present to setiger #	Pseudocompound hooks: # of teeth	Subacicular hooks from setiger #	# of teeth in pectinate setae	Remarks
acapulcensis	4	4	12–15	5	12	?	3	15–18	15–20	—
cedroensis	4	5	3–4	4	5–6	3	3	14	9–10	Type examined
dorsalis	4	4	4	6	3	5	1 or 3	18	13	Sensu Hartmann-Schröder (1962)
geminata	6	6	9–10	9	8–9	7	2–3	23	12	New species
heterouncinata	3	4	?	4	1	4	2–3	12	?	—
investigatoris	15	7	?	6–7	10	5–6	2–3	?	?	Br. from 5–6
lineata	5	5	4–5	6	7	7	3	15	8	New name
multidentata	3	1	irreg.	2–3	10	3	3	9	10–14	—
nannognathus	16	16	5–8	7	8	6	3	21	14	Br. from 5, type examined
oligobranchiata	2	3	0	3–4	1	3	3	10–15	14	Br. on few set.
pourtalesii	10	12	10	3	8	?	3	?	20	Br. from 7–9
proalopus	17–18	4	6–7	7	6	5	3	21	15	Type examined
profundi	10	10	5–7	7	4	3	3	20	10	Br. from 7, type examined
similis	7	7	7–10	6	1	4	3	8	10	Type examined
tenuis	?	?	6–7	5–6	4	5	3	14	14	Orensanz (1974)
zebra	8	5	10–15	10	8	5	3	—	12	Compound spinigers present Type examined

Table 5.—Summary statistics on numerical features, *Onuphis (O.) pulchra*.

	Range	Mean	Stand. dev.	Number of observ.
Occipital antennae				
length of inner lateral	4–7	4.87	.58	38
length of median	3–6	4.26	.79	38
number of rings	5	invariant		
Branchiae				
start	5–7	5.98	.20	104
max. # filaments	2–5	3.32	.57	38
Cirriform ventral cirri	9–10	9.12	.56	104
Pseudocompound hooks to setiger #	6	invariant		
Simple hooks				
start	4	invariant		
end	15–19	16.16	1.37	38
Subacicular hooks from setiger #	16–20	17.34	.97	104

Table 6.— →

Table 7.—Summary statistics on variable features, *Onuphis (O.) virgata*.

	Range	Mean	Stand. dev.	Number of observ.
Occipital antennae				
length of inner lateral	3–5	3.60	.89	5
length of median	3–4	3.40	.55	5
number of rings	4–5	4.20	.45	5
Branchiae				
start	6–7	6.20	.45	5
max. # filaments	3–5	4.40	.89	5
Cirriform ventral cirri	11–13	12.20	.84	5
Pseudocompound hooks to setiger #	7	invariant		5
Simple hooks				
start	4	invariant		5
end	21–22	21.60	.55	5
Subacicular hooks from setiger #	22–23	22.60	.55	5

Table 6.—Species of *Onuphis* (*Onuphis*) with first branchiae at about setiger 6 and simple (large) hooks in some anterior setigers.

Name	Occipital antennae: Length of: i.l.	Occipital antennae: Length of: m.	Occipital antennae: # of rings	# of cirriform ventral cirri	Max. # of branchial fil.	Pseudocompound hooks: present to setiger #	Pseudocompound hooks: # of teeth	# of setigers with large hooks	Subacicular hooks from setiger #	# of teeth in pectinate setae	Remarks
fragilis	?	?	0	7	2	6	3	12	25	?	Type exam.
jenneri	3	2	4–5	2	6	4–5	3	30–35	30–35	15	Type exam.
microcephala	8	8	4–5	2	6–7	3	3	25	26	10	Gardiner (1976)
pigmentata	4	2	3–4	2	6–7	3	2–3	24	25	12–14	First br. on 7
pulchra	4–7	3–6	5	9–10	2–5	6	3	15–19	16–20	12	New species
setosa	?	?	4–6	4–8	6–7	4–5	2 or 3	13 or 17	12–21	8–10	Orensanz (1974)
taeniata	15	11	5–10	8–9	3–4	7	2–3	10	37–41	10–12	
vermillionensis	3	3	4–5	9	3–4	8	3	10	12	12–13	Type exam.
virgata	3–5	3–4	4–5	11–13	3–5	7	3	21–22	22–23	8	New species